DATAR PUSTAKA

Abokitse, K., Wu, M., dan Bergeron, H. 2010. **Thermostable Feruloyl Esterase for The Bioproduction of Ferulic Acid from Triticale Bran**. Appl Microbiol Biotechnol. 87: 195-203.

Abraham, E., Deepa, B., Pothan, L. A., Jacob, M., Thomas, S., Cvelbar, U., dan Anandjiwala, R. 2011. **Extraction of nanocellulose fibrils from lignocellulosic fibres: A novel approach.** Carbohydrate Polymers. 86: 1468-1475.

Aguiar, A., dan Ferraz, A. 2007. **Fe^{3+} and Cu^{2+} reduction by phenol derivatives associated with Azure B degradation in Fenton-like reactions**. Chemosphere. 66: 947-954.

Arabi, A., Mizani, M., dan Honarvar, M. 2017. **The use of sugar beet pupl lignin for the production of vanillin.** International Journal of Biological Macromolecules. 94: 345-354.

Aslam, S., dan Asgher, M. 2011. **Partial purification and characterization of ligninolytic enzymes produced by *Pleurotus ostreatus* during solid state fermentation.** African Journal of Biotechnology. 10: 17875-17883.

Asgher, M., Yasmeen, Q., dan Iqbal , H. M. N. 2013. **Enhanced decolorization of Solar brilliant red 80 textile dye by an indigenous white rot fungus *Schizophyllum commune* IBL-06.** Saudi Journal of Biological Sciences. 20: 347-352.

Barbosa, E. D. S., Perrone, D., Vendramini, A. L.D. A., Leite, S. G. F. 2008. **Vanillin production by *Phanerochaete chrysosporium* grown on green coconut agroindustrial husk in solid state fermentation.** Bioresources. 3: 1042-1050.

Brochado, A.R., Matos, C., Møller, B.L., Hansen, J., Mortensen, U.H., and Patil, K.R. 2010. **Improved vanillin production in baker's yeast through in silico design**. Microb. Cell Fact. 9:84.

Bugg, T. D. H., Ahmad, M., Hardiman, E. M., and Rahmanpour, R. 2011**. Pathways for degradation of lignin in bacteria and fungi**. Natural Product Reports. 28: 1871-1960.

Conde-Mejia, C., Jimenez-Gutierrez, A., El-Halwagi, M. 2012. **A Comparison of Pretreatment Methods for Bioethanol Production form Lignocellulosic Material**. Process Safety and Environmental Protection 90. Hal 191.

Converti, A., Aliakbarian, B., Dominguez, J. M., Vazquez, G. B., dan Perego, P. 2010. **Microbial production of Biovanillin.** Brazilian Journal of Microbiology. 41: 519-530.

Daud, Z., Kassim, A. S. M., Aripin, A. M., Awang, H., dan Hatta, Z. M. 2013. **Chemical Composition and Morphological of Cocoa Pod Husks and**

Cassava Peels for Pulp and Paper Production. Australian Journal of Basic and Applied Sciences. 7 (9): 406-411.

Dey, T. B. dan Kuhad, R. D. 2014. **Enhanced production and extraction of phenolic compounds from wheat by solid-state fermentation with *Rhizopus oryzae* RCK2012.** Biotechnology Reports. 4: 120-127.

Esser, K., Bennett, J.W., Osiewacz, H.D. 2002. **The Mycota; A Comprehensive Treatise on Fungi as Experimental Systems for Basic and Applied Research, Industrial Application X**. Germany: Springer.

Fache, M., Boutevin, B., dan Caillol, S. 2015. **Vanillin, a key-intermediate of biobased polymers*.*** European Polymer Journal. 68: 448-502.

Falah, F. 2012. **Pembuatan Surfaktan Natrium Lignosulfonat dari Tandan Kosong Kelapa Sawit dengan Sulfonasi Langsung**. Tesis. Fakultas Teknik Universitas Indonesia.

Fauzi, A. R., Haryadi, D., dan Priyanto, S. 2012. **Pengaruh Waktu Fermentasi dan Efektivitas Adsorben dalam Pembuatan Bioetanol *Fuel Grade* dari Limbah Pod Kakao (*Theobroma cacao).*** Jurnal Teknologi Kimia dan Industri. 1: 179-185.

FitzPatrick, M., Champagne, P., Cunningham, M. F., dan Whitney, R. A. 2010. **A biorefinery processing perspective: Treatment of lignocellulosic materials for the production of value-added products.** Bioresource Technology. 101: 8915-8922.

Friedrich, L. C., Zanta, C. L.R. S., Jr Machulek, A., Silva, V., O., dan Quina, F. H. 2012. **Interference of inorganic ions on phenol degradation by the Fenton reaction.** Scientia Agricola. 69: 347-351.

Fu, K., Fu, S., Zhan, H., Zhou, P., Liu, M., dan Liu, H. 2013. **A newly isolated wood-rot fungus for lakase production in submerged cultures.** Bioresources. 8: 1385-1397.

Gallage, N. J., dan Moller, B. L. 2015. **Vanillin-Bioconversion and Bioengineering of the most popular plant flavor and its *De Novo* biosynthesis in the Vanilla Orchid.** Molecular Plant. 8: 40-57.

Gallage, N. J., Hansen, E. H., Kannangara, R., Olsen, C. E., Motawia, M. S., Jorgensen, K., Holme, I., Hebelstrup, K., Grisoni, M., Moller, B. L. 2014. **Vanillin formation from ferulic acid in *Vanilla planifolia* is catalysed by a single enzyme.** Nature communications. Macmillan Publishers Limited.

Gassara, F., Brar, S. K., Tyagi, R. D., Verma, M., dan Surampalli, R. Y. 2010. **Screening of agro-industrial wastes to produce ligninolytic enzymes by *Phanerochaete chrysosporium.*** Biochemical Engineering Journal. 49: 388-394.

Gedikli, S., Aytar, P., Unal, A., Yamac, M., Cabuk, A., dan Kolankaya, N. 2010. **Enhancement with indusers of lacasse production by some strains**

and application of enzyme to dechlorination of 2,4,5-trichlorophenol. Electronic journal of biotechnology. 13: 1-15.

Ghosh, S., Sachan, A., dan Mitra, A. 2006. **Formation of vanillic acid from ferulic acid by *Paecilomyces variotii* MTCC 6581.** Current Science. 90: 825-829.

Gioia, D. D., Luziatelli, F., Negroni, A., Ficca, A. G., Fava, F., dan Ruzzi, M. 2011. **Metabolic engineering of *Pseudomonas fluorescens* for the production of vanillin from ferulic acid.** Journal of Biotechnology. 156: 309-316.

Gomaa, O. M., dan Momtaz, O. A. 2015. **Tembaga induction and differential expression of lakase in *Aspergillus flavus.*** Journal of Microbiology. 46: 285-292.

Graf, N. Dan Altenbuchner, J. 2014. **Genetic engineering of *Pseudomonas putida* KT2440 for rapid and high-yield production of vanillin from ferulic acid.** Microbiol Biotechnol. 98: 137-149.

Halliwell, B dan Grootveld, M. 1988. **Methods for the measurement of hydroxyl radicals in biochemical systems: Deoxyribose degradation and aromatic hydroxylation.** Methods of biochemical Analysis. 33: 59-90.

Haghdan, S., Renneckar, S., dan Smith, G. D. 2016. **Sources of Lignin.** Elsevier.

Hamad, H. O., Alma, M. H., Ismael, H. M., dan Goceri, A. 2014. **The effect of some sugars on the growth of *Aspergillus niger*.** 2014. Journal Nat. Sci. 17: 7-11.

Hastrup, A.C.S., F. Green, C.A. Clausen, and B. Jensen. 2005. ***Tolerance of Serpula lacrymans to cooper-based wood preservatives***. International Biodeterioration & Biodegradation 56: 173-177.

Hattaka, A. 1994. ***Modifying Enzymes from Selected White-Rot Fungi: Production and Role in Lignin Degradation***. Microbiology 13:125-135.

Heitner, C., Dimmel, D. R., dan Schmidt, J. A. 2010. **Lignin and lignans advances in Chemistry.** CRC Press. New York.

Hingse, S. S., Digole, S. B., dan Annapure, U. S. 2014. **Method development for simultaneous detection of ferulic acid and vanillin using high-performance thin layer chromatography.** Journal of Analytical Science and Technology. 5: 21-29.

Holladay, J. E., Bozell, J. J, White, J. F., dan Johnson,D. 2007. **Top value-added chemicals from biomass.** Pacific northwest National Laboratory. USA.

Horisawa, S., Ando, H., Ariga, O., dan Sakuma, Y. 2015. **Direct ethanol production from cellulosic materials by consolidated biological processing using the wood rot fungus *Schizophyllum commune.*** BioresourceTechnology. 197: 37-41.

Hua, D., Ma, C., Song, L., dan Lin, S. 2007. **Enhanced vanillin production from ferulic acid using adsorbent resin.** Appl Microbiol Biotechnol. 74: 783-790.

Hsu, T. A., M.R. Ladisch, and G.T. Tsao. 1980. **Alcohol from Cellulose.** Chemical Technology. 10: 315-319.

Irshad, M., dan Asgher, M. 2011. **Production and optimization of lignolytic enzymes by white rot fungus *Schizophyllum commune* IBL-06 in solid state medium banana stalks.** African Journal of Biotechnology. 10: 18234-18242.

Isikhuemhen, O. S., Mikiashvili, N. A., Senwo, Z.N., dan Ohimain, E. I. 2014. **Biodegradation and Sugar Release from Canola Plant Biomass by Selected White Rot Fungi**. Biological Chemistry. 4: 395-406.

Janusz, G., Kucharzyk, K. H., Pawlik, A., Staszczak, M., dan Paszczynski, A. J. **2013. *Fungal lakase, manganese peroxidase and lignin peroxidase: Gene expression and regulation.*** *Enzyme and Microbial Technology. 52: 1-12.*

Jing, D. 2010. **Improving the simultaneous production of lakase and lignin peroxidase from Istreptomyces lavendulae by medium optimization.** Bioresource Technology. 101: 7592-7597.

Hyde, S. M., dan Wood, P. M. 1997. **A mechanism for production of hydroxyl radicals by the brown-rot fungus *Coniophora puteana:* Fe (III) reduction by cellobiose dehydrogenase and Fe (II) oxidation at a distance from the hypae.** Microbiology. 143: 259-266.

Kalra, K., Chaucan, R., Shavez, M And Sachveda, S. 2013. **Isolation of lakase producing *Trichoderma Spp*. and effect of pH and temperature on Its activity.** *International Journal of ChemTech Reasearch.* 5): 2229-2235.

Karkas, M. D., Matsuura, B. S., Monos, T. M., Magallanes, G., dan Stephenson, C. R. J. 2016. **Transition-metal catalyzed valorization of lignin: the key to a susteinable carbon-neutral future.** Organic & Biomolecular Chemistry. 14: 1853-1914.

Kaur, B., dan Chakraborty, D. 2013. **Biotecnological and Molecular Approaches for Vanillin Production: a Review.** Appl Biochem Biotechnol. 169: 1353-1357.

Kumar, N. dan Pruthi, V. 2014. **Potential applications of ferulic acid from natural sources.** Biotechnology reports. 4: 86-93.

Khamarudding, P. F., Bustam, M. A., dan Omar, A. A. 2011. **Using Fenton's reagents fr the degradation of Diidopropanolamine: Effect of temperature and pH.** International Conference on Environment and Industrial Innovation. 12: 12-17.

Lun, O. K., Wai, T. B., dan Ling, L. S. 2014. **Pineapple Cannery Waste as a Potential Substrate for Microbial Biotranformation to Produce Vanillic Acid and Vanillin.** International Food Research Journal. 21: 953-958.

Ma, X., dan Daugulis, A. J. 2014. **Effect of Bioconversion Conditions on Vanillin Production by Amycolatopsis Sp. ATCC 39116 Through an Analysis of Competing by-Product Formation**. Bioprocess Biosyst Eng. 37: 891-899

Ma, J., Yang, H., Kun, W., dan Liu, X. 2016. **Structural modification of hemicelluloses and lignin based on the biorefinery process with white-rot fungal.** Carbohydrate polymers. 153: 7-13.

Mabinya, L. V., Mafunga, T., dan Brand, J. M. 2010. **Bioconversion of Ferulic Acid and 4-Vinylguaiacol yy A White-Rot Fungus Isolated from Decaying Wood.** African Journal of Biotechnology. 9: 1955-1958.

Manavalan, T dan Manavalan, A. 2015. **Characterization of lignocellulolytic enzymes from white-rot fungi.** Current microbiology. 70: 485-498.

Martin-Sampedro, R., Capanema, E.A., Hoeger, I., Villar, J.C., Rojas, O.J., 2011. **Ligninchanges after steam explosion and lakase-mediator treatment of eucalyptuswood chips**. J. Agric. Food Chem. 59, 8761–8769.

Meng, Q., Zou, J., Zou, J., Jiang, W., dan Liu, D. 2007. **Effect of Cu2+ concentration on growth, antioxidant enzyme activity and malondialdehyde content in garlic (*Allium sativum L.).*** ACTA BIOLOGICA CRACOVIENSIA Series Botanica. 49: 95-101.

Monrroy, M., Ortega, I., Ramirez, M., Baeza, J., dan Freer, J. 2011. **Structural change in wood by brown rot fungi and effect on enzymatic hydrolysis.** Enzyme and Microbial Technology. 49: 472-477.

Montoya, S., Sanchez, O. J., dan Levin, L. 2015. **Production of lignocellulolytic enzymes from three white-rot fungi by solid-state fermentation and mathematical modeling.** African journal of Biotechnology. 14: 1304-1317.

Mosier,N., C. Wyman, B. Dale, R. Elander, Y.Y Lee, M. Holtzapple, and M. Ladisch. 2005. **Features of Promising Technologies for *Pretreatment* of Lignocellulosic Biomass**. Bioresource Technology 96: 637-686.

Motedayen, N., Ismail, M. B. T., dan Nazarpour, F. 2013. **Bioconversion of ferulic acid to vanillin by combined action of *Aspergillus niger* K8 dan *Phanerochaete crysosporium* ATCC 2475**. African Journal of Biotechnology. 12: 6618-6624.

Mussatto, S. I., dan Teixera, J. A. 2010. **Lignocellulose as raw material in fermentation processes.** Formatex

Niemenmaa, O. 2008. **Monitoring of Fungal Growth and Degradation of Wood**. Dissertation.University of Helsinki. Finland.

Nieter, A., Kelle, S., Linke, D., dan Berger, R. G. 2016. **Feruloyl esterases from Schizophyllum commune to treat food industry side-streams.** Bioresource Technology 220: 38–46

Nurika, I. 2013. **Mechanisms of lignocellulosic conversion by the brown rot fungus*Serpula lacrymans.*** Thesis of Doctor of Phylosophy. University of Warwick. United Kingdom.

Okano, K.; Kitagaw, M.; Sasaki, Y.; Watanabe, T. 2005. **Conversion of Japanese Red Cedar (*Cryptomeria japonica*) Into A Feed for Ruminants by White-Rot Basidiomycetes.** *Animal Feed Sci. Technol 120*: 235–243.

Oliva-Taravilla, A., Tomás-Pejó, E., Demuez, M., González-Fernández, C., Ballesteros, M. 2016. **Phenols and lignin: Key players in reducing enzymatic hydrolysis yields of steam-pretreated biomass in presence of lakase**. Journal of Biotechnology. 218: 94-101.

Panatagama, F.R.D., Argo, B. D., dan Yulianingsih, R. 2013. **Pemanfaatan Iradiasi Gelombang Mikro untuk Memaksimalkan Proses Pretreatement Degradasi Lignin Jerami Padi (Pada Produksi Bioetanol)**. Jurnal Bioproses Komoditas Tropis. 1: 13-20.

Perez J., J. Munoz-Dorado, T. de la Rubia and J. Martinez. 2002. **Biodegradation and biological treatments of cellulose, hemicellulose and lignin: an overview**. Int. Microbiol. **5**:53-63.

Plaggenborg, R., Overhage, J., Loos, A., Archer, J. A. C., Lessard, P., Sinskey, A. J., Steinbüchel, A., dan Priefert, H. 2006. **Potential of Rhodococcus strains for biotechnological vanillin production from ferulic acid and eugenol.** Appl Microbiol Biotechnol. 72: 745–755

Rachim, P. F., Mirta, E. L., dan Thoha, M. Y. 2012. **Pembuatan Surfaktan Natrium Lignosulfonat dari Tandan Kosong Kelapa Sawit dengan Sulfonasi Langsung**. Jurnal Teknik Kimia No. 1(18):41-46.

Ruch, R.J., Cheng, S.T., dan Klauring, J.E. 1989. **Prevention of cytotoxicity and inhibition of intercellular communication by antioxidant catechins isolated from Chinese green tea.** Carcinogenesis. 10: 1003–1008.

Sanchez, C. 2009. **Lignocellulosic residues: Biodegradation and bioconversion by fungi**. Biotechnology Advances. 27: 185-194.

Santos, D. A., Oliveira, M. M., Curvelo, A. A. S., Fonseca, L. P., Porto, A. L. M. 2017. **Hydrolysis of cellulose from sugarcane bagasse by cellulases from marine-derived fungi strains**. International Biodeterioration & Biodegradation. 121: 66-78

Sarangi, P. K., dan Sahoo, H. P. 2010. **Ferulic acid production from wheat bran using *Staphylococcus aureus.*** New York Science Journal. 3: 79-81.

Shakeri, A., Rad, S. M., dan Ghasemian, A. 2013. **Oxidative production of vanillin from industrial lignin using oxygen and nitrobenzene: A**

comparative study. International journal of farming and allied sciences. 2: 1165-1171.

Sharma, A., Aggarwal, N. K., Yadav, A. 2016. **First Report of Lignin Peroxidase Production from *Alternaria alternata* ANF238 Isolated from Rotten Wood Sample.** Bioengineering and Bioscience. 4: 76-87.

Singh, D., dan Chen, S. 2008. **The white rot fungus *Phanerochaete chrysosporium:* conditions for the production of lignin-degrading enzymes.** Application Microbial Biotechnology. 81, 399-417.

Sulej, J., Janusz, G., Mazur, A., Zuber, K., Zebracka, A., dan Rogalski, J. 2013. **Cellobiose dehydrogenase from ligninolytic basidiomycete *Phlebia lindtneri.*** Process Biochemistry. 48: 1715-1723.

Sun, X.F., Xu, F., Sun, R.C., Fowler, P., Baird, M.S., 2005. Characteristics of degradedcellulose obtained from steam-exploded wheat straw. Carbohydr. Res. 340,97–106.

Taherzadeh, M.J., dan Karimi, K. 2007. **Acid-based Hydrolisis Process for Ethanol from Lignosellulosic Material: A Review**. BioResources. 2. 472-499.

Takao, S. 1965. **Organic acid production by Basidiomycetes.** Applied Microbiology.13: 732-737.

Talebnia, F., Karakashev, D. and Angelidaki, I. 2010. **Production of bioethanol from wheat straw: An overview on pretreatment, hydrolysis and fermentation**. *Bioresource Technology*. 101: 4744-4753.

Tang, J. D., Parker, L. A., Perkins, A. D., Sonstegard, T. S., Schroeder, S. G., Nicholas, D. D., dan Diehl, S. V. 2013. **Gene Expression Analysis of Tembaga tolerance and Wood Decay in the brown rot fungus *Fibroporia radiculosa.*** Applied and Environmental Microbiology. 79: 1523-1533.

Torres, B. R., Aliakbarian, B., Torre, P., Perego, P., Dominguez, J. M., Zilli, M., Converti, A. 2009. **Vanillin bioproduction from alkaline hydrolyzate of corn cob by *Escherichia coli* JM109/pBB1.** Enzyme and Microbial Technology. 44: 154-158.

Tsujiyama, S., dan Ueno, M. 2008. **Formation of 4-Vinyl guaiacol as an intermediate in Bioconversion of ferulic acid by *Schizophyllum commune.*** Biosci. Biotechnol. Biochem. 72: 212-215.

Tuomela, M. 2002. **Degradation of lignin and other 14C-labelled compounds in compost and soil with an emphasis on white-rot fungi.** Helsinki: Dep. Appl. Chem. Microbiol. Division of Microbiology University of Helsinki

Ujor, V. C., Monti, M., Peiris, D. G., Clements, M. O., Hedger, J. N., 2012. **The mycelial response of the white-rot fungus, Schizophyllum commune to the biocontrol agent, Trichoderma viride.** Fungal biology. 116: 332-341.

Usha, K. Y., Praveen, K., dan Reddy, B. R. 2014. **Enhanced production of ligninolytic enzymes by a mushroom *Stereum ostrea.*** Biotechnology Research International. 2014: 1-9

Vriesman, L. C., Amboni, R. D. D. C., dan Petkowicz, C. L. D. 2011. **Cacao pod husk (*Theobroma cacao L.*): Composition and hot-water-soluble pectins.** Industrial crops and products. 34: 1173-1181.

Vrsanska, M., Buresova, A., Damborsky, P., Adam, V. 2015. **Influence of different indusers on ligninolytic enzyme activities.** Journal of Metallomics and Nanotechnologies. 3: 64-70.

Waliszewski, K. N., Pardio, V. T., dan Ovando, S. L. 2006. **A simple and rapid HPLC technique for vanillin determination in alcohol extract**. Food Chemistry. 101: 1059-1062.

Watanabe, T., Shitan, N., Umezawa, T., Yazaki, K., Shimada, M., dan Hattori, T. 2007. **Involvement of FpTRP26, a thioredoxin-related protein, in oxalic acid-resistance of the brown-rot fungus *Fomitopsis palustris.*** FEBS. Letters. 581 : 1788-1792.

Ward, G. Hadar, Y. Dosoretz, C.G. 2004. ***The Biodegradation of Lignocellulose by White-rot Fungi. Fungal Biotechnology in Agricultural, Food, and Environmental Applications.*** Ed, Arora, D.K. Marcel Dekker, Incorporation., New York

Ward-Doria M., Arzuaga-Garrido J., Ojeda K.A., Sánchez E. 2016. **Production of biogas from acid and alkaline pretreated cocoa pod husk (*Theobroma cacao L.*).** International Journal of ChemTech Research. 9: 252-260.

Watkinson, S. C., dan Eastwood, D. C. 2012. **Serpula lacrymans, Wood and Buildings. Advances in apllied microbiology.** Chapter 5. 78: 121-149.

Widianingsih, Y. 2009. Analisis Faktor-Faktor yang Mempengaruhi Permintaan Ekspor Biji Kakao di Indonesia di Malaysia, Singapura, dan Cina. Skripsi.Institut Pertanian Bogor. Bogor.

Witayakran, S., Ragauskas, A.J., 2009. Modification of high-lignin softwood kraftpulp with lakase and amino acids. Enzyme Microb. Technol. 44, 176–181.

Xu, G. And Goodell, B. 2001. **Mechanisms of wood degradation by brown-rot fungi: chelator-mediated cellulose degradation and binding of iron by cellulose**. Journal of Biotechnology. 87.

Xu, X., Xu, Z., Shi, S., dan Lin, M. 2017. **Lignocellulose degradation patterns, structural changes, and enzyme secretion by *Inonotus obliquus* on straw biomass under submerged fermentation.** Bioresource Technology, Accepted manuscript. doi:10.1016/j.biortech.2017.05.087

Yazici, E. Y. dan Deveci, H. 2010. **Factor affecting decomposition of hydrogen peroxide.** Proceedings of the XIIth International Mineral Processing Symposium. Turkey.

Zhang, L., Xing, Y., Liu, C., Zhou, X., dan Shi, H. 2015. **Label-free colorimetric detection of Cu2+ on the basis of Fenton reaction-assisted signal amplification with unmodified gold nanoparticles as indicator**. Sensors & Actuators: B. Chemical, 215 : 561-567

Zhang, S., Jiang, M., Zhou, Z., Zhao, M., dan Li, Y. 2012. **Selective removal of lignin in steam-exploded rice straw by Phanerochaete *chrysosporium*.** International Biodeterioration & Biodegradation . 75: 89-95.

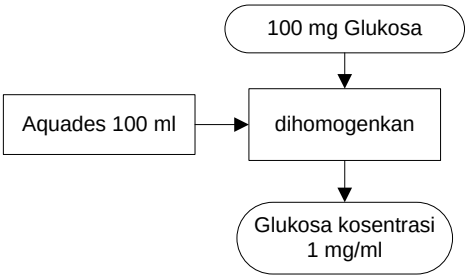
Zheng,S., Qin, X., dan Xxia, L. 2017. **Degradation of the herbicide isoproturon by lakase-mediator systems.** Biochemical Engineering Journal. 119: 92-100.

Zugenmaier, P. 2008. **Crystalline Cellulose and Cellulose Derivatives Characterization and Structures.** Springer: New York**.**

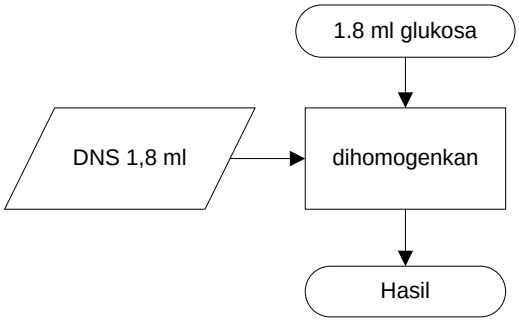
LAMPIRAN

Lampiran 1. Prosedur Uji Total Gula Reduksi dengan Metode DNS (Miller, 1959)

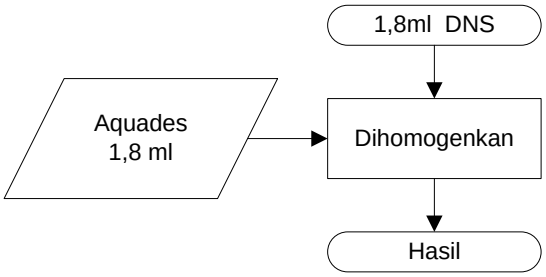
A. Pembuatan larutan Glukosa



B. Pembuatan larutan DNS dan glukosa

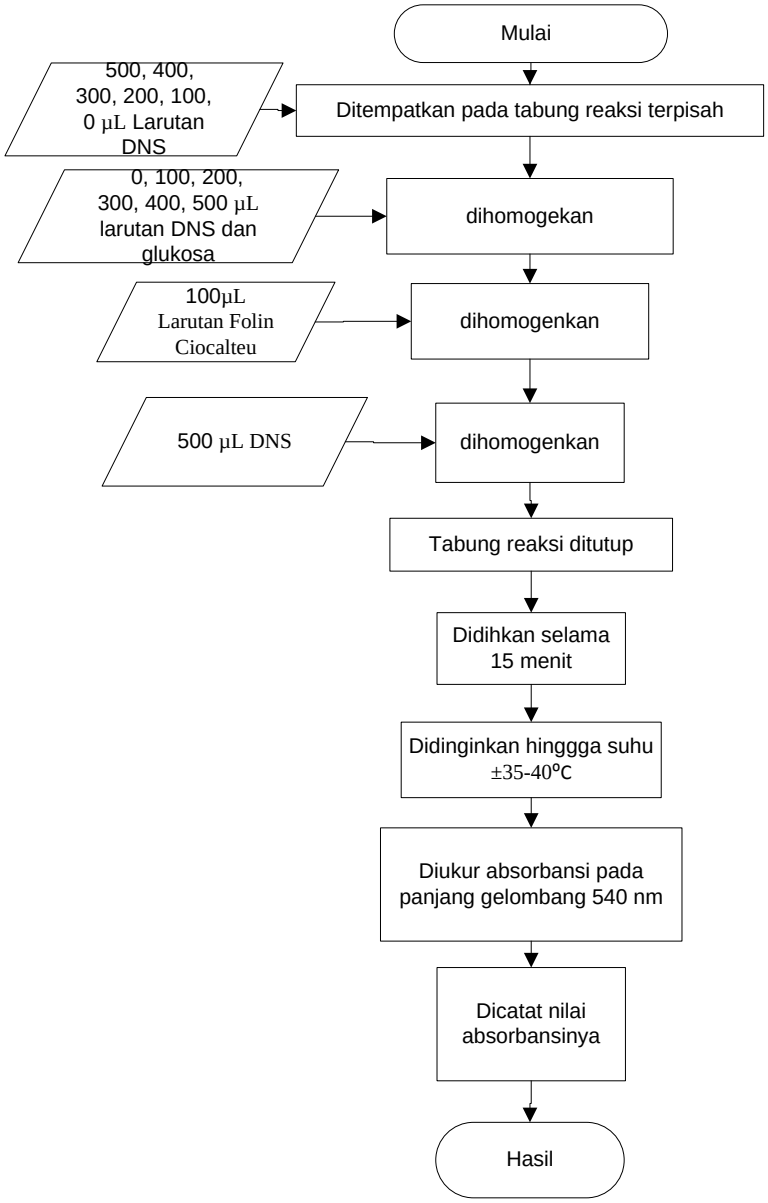


C. Pembuatan larutan DNS



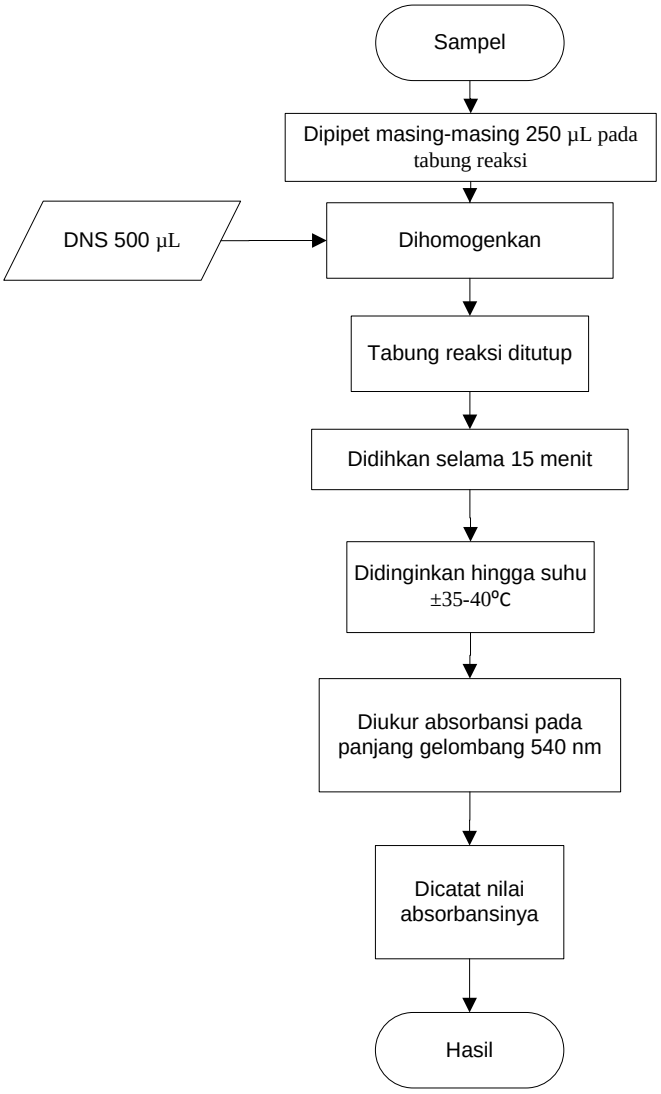
Lampiran 1. Prosedur Uji Total Gula Reduksi dengan Metode DNS (Miller, 1959) (Lanjutan)

D. Pembuatan larutan Standart



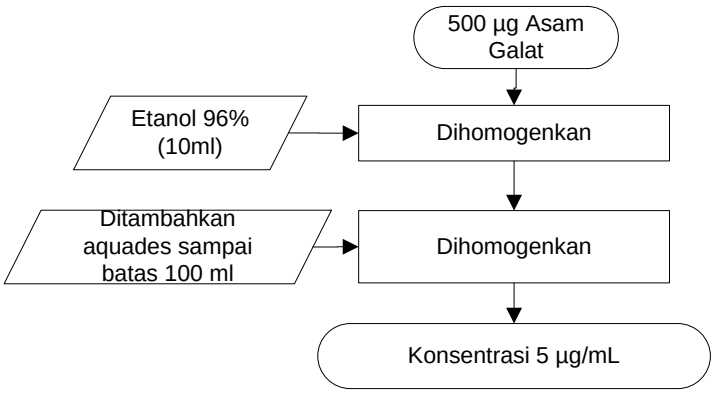
Lampiran 1. Prosedur Uji Total Gula Reduksi dengan Metode DNS (Miller, 1959) (Lanjutan)

E. Pengujian sampel

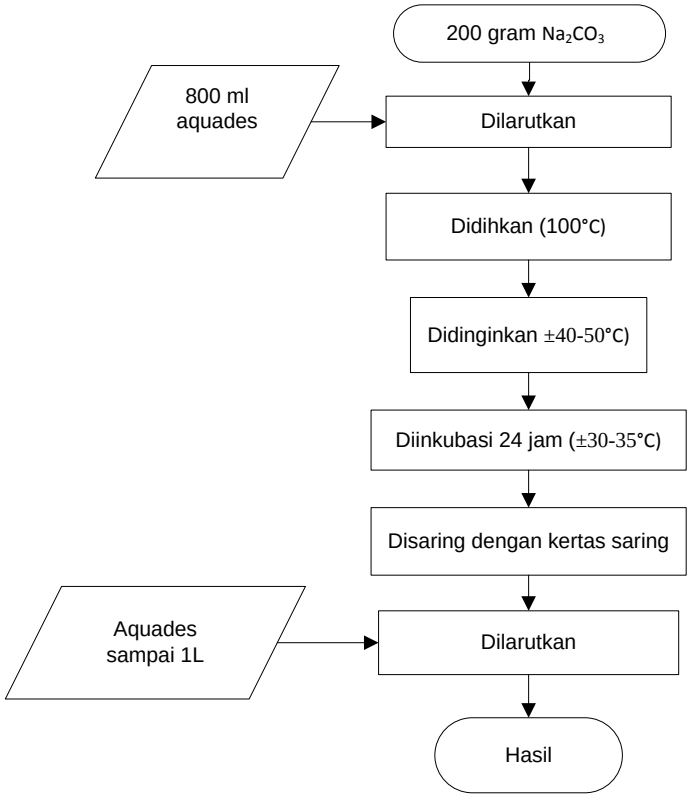


Lampiran 2. Prosedur Uji Total Fenol Terlarut dengan Metode Follin Ciocalteu (Singleton and Rossi, 1965)

A. Diagram alir pembuatan larutan asam galat

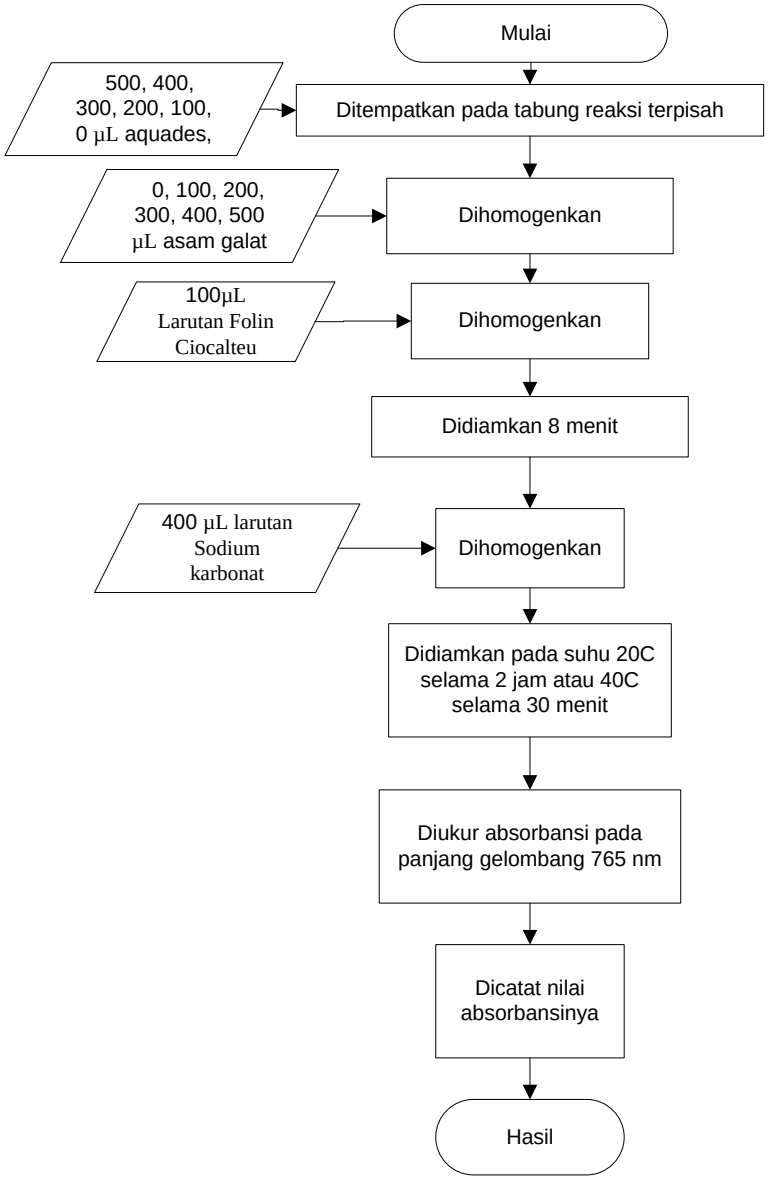


B. Diagram alir proses pembuatan larutan Na_2CO_3 (Sodium Karbonat)



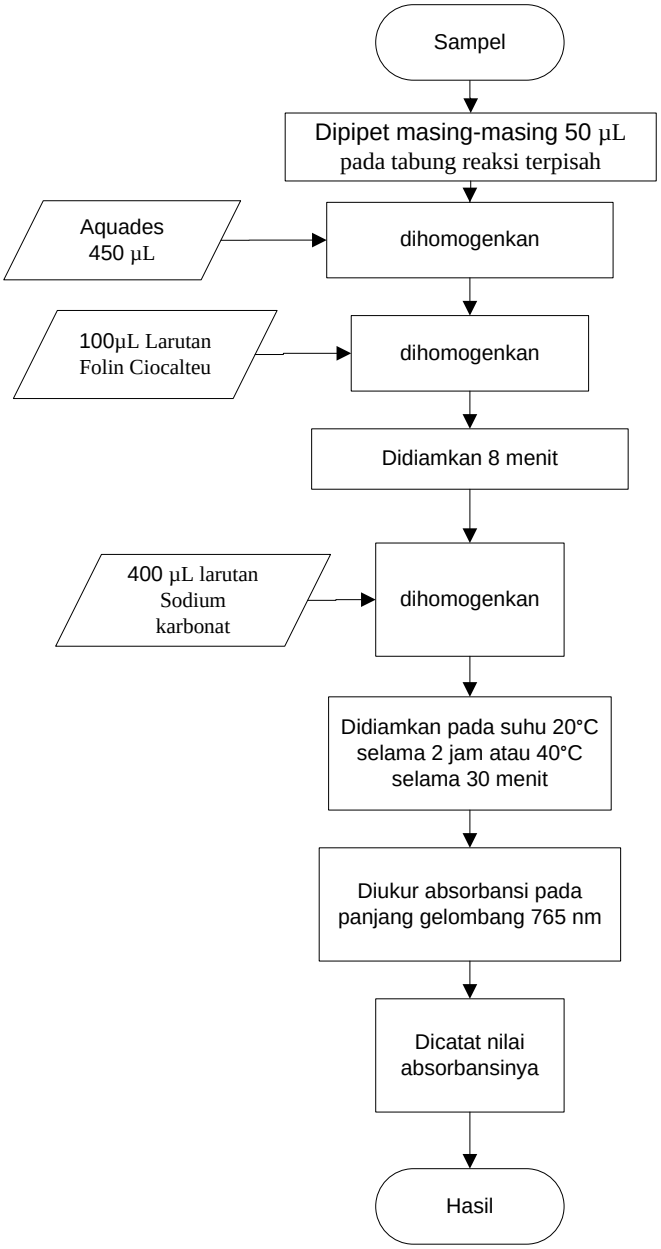
Lampiran 2. Prosedur Uji Total Fenol Terlarut dengan Metode Follin Ciocalteu (Singleton and Rossi, 1965) (Lanjutan)

C. Pembuatan Standart



Lampiran 2. Prosedur Uji Total Fenol Terlarut dengan Metode Follin Ciocalteu (Singleton and Rossi, 1965) (Lanjutan)

D. Pengujian Sampel



Lampiran 3. ANOVA

TSP

Jenis Jamur (A)	Konsentrasi CuSO4 (B)	Lama Waktu (C)	Ulangan 1	Ulangan 2	Ulangan 3	Total Perlakuan
S. commune	0	0	0,68	0,058	0,075	0,813
		1	0,116	0,088	0,114	0,318
		2	0,172	0,125	0,169	0,466
		3	0,177	0,14	0,155	0,472
		4	0,291	0,262	0,249	0,802
		5	0,151	0,112	0,196	0,459
	Total A1B1K		**1,587**	**0,785**	**0,958**	**3,33**
	0,5	0	0,086	0,067	0,061	0,214
		1	0,99	0,119	0,104	1,213
		2	0,129	0,137	0,12	0,386
		3	0,175	0,179	0,176	0,53
		4	0,144	0,256	0,226	0,626
		5	0,112	0,165	0,199	0,476
	Total A1B1K		**1,636**	**0,923**	**0,886**	**3,445**
	1,5	0	0,082	0,07	0,066	0,218
		1	0,061	0,095	0,139	0,295
		2	0,107	0,115	0,098	0,32
		3	0,197	0,185	0,179	0,561
		4	0,279	0,262	0,144	0,685
		5	0,125	0,194	0,172	0,491
	Total A1B1K		**0,851**	**0,921**	**0,798**	**2,57**
	2,5	0	0,056	0,07	0,083	0,209
		1	0,085	0,092	0,089	0,266
		2	0,095	0,142	0,098	0,335
		3	0,18	0,172	0,193	0,545
		4	0,279	0,144	0,144	0,567
		5	0,212	0,247	0,213	0,672
	Total A1B1K		**0,907**	**0,867**	**0,82**	**2,594**
Total A1K			4,981	3,496	3,462	11,939
S. lacrymans	0	0	0,065	0,069	0,091	0,225
		1	0,072	0,096	0,077	0,245
		2	0,116	0,111	0,145	0,372
		3	0,128	0,104	0,093	0,325
		4	0,27	0,272	0,292	0,834
		5	0,159	0,417	0,368	0,944
	Total A1B1K		**0,81**	**1,069**	**1,066**	**2,945**
	0,5	0	0,092	0,083	0,064	0,239
		1	0,09	0,096	0,092	0,278
		2	0,111	0,133	0,1	0,344
		3	0,129	0,098	0,123	0,35
		4	0,291	0,308	0,301	0,9
		5	0,334	0,39	0,159	0,883
	Total A1B1K		**1,047**	**1,108**	**0,839**	**2,994**
	1,5	0	0,06	0,067	0,079	0,206
		1	0,099	0,109	0,087	0,295
		2	0,083	0,113	0,152	0,348
		3	0,144	0,099	0,128	0,371
		4	0,273	0,274	0,283	0,83
		5	0,407	0,159	0,159	0,725
	Total A1B1K		**1,066**	**0,821**	**0,888**	**2,775**
	2,5	0	0,072	0,084	0,06	0,216
		1	0,084	0,088	0,114	0,286
		2	0,128	0,092	0,056	0,276
		3	0,085	0,159	0,105	0,349
		4	0,282	0,271	0,28	0,833
		5	0,159	0,159	0,383	0,701
	Total A1B1K		**0,81**	**0,853**	**0,998**	**2,661**
Total A1K			3,733	3,851	3,791	**11,375**
TOTAL KELOMPOK			8,714	7,347	7,253	23,314

Source	DF	JK	KT	F-hit		F 0,05
Petak Utama (PU)						
Kelompok	2	0,028				
Jenis Jamur (A)	1	0,002	0,002	0,126	tn	18,510
Galat (a)	2	0,035	0,018			
Anak Petak						
Konsentrasi CuSO4 (b)	3	0,032	0,011	0,179	tn	3,410
Jenis Jamur * Konsentrasi CuSO4 (AxB)	3	0,009	0,003	0,050	tn	3,410
Galat (b)	12	0,703	0,059			
Anak-anak petak						
Lama Waktu (c)	5	0,460	0,092	35,725	**	**2,330**
Jenis Jamur *Lama Waktu (AxC)	5	0,151	0,030	11,748	**	2,330
Konsentrasi CuSO4 * Lama Waktu (BxC)	15	0,135	0,009	3,500	**	1,790
Jenis Jamur*Konsentrasi CuSO4*Lama Waktu (AxBxC)	15	0,170	0,011	4,403	**	1,790
Galat (c)	80	0,206	0,003			
Total	**143**	**1,903**				

Tabel t	Signifikasi		Sd	LSD
	0,05	0,01		0,05
Galat (a)	4,303	9,925	0,02205	0,09487
Galat (b)	2,086	2,845	0,05705	0,119
Galat (c)	1,993	2,646	0,01465	0,02919

Lampiran 3. ANOVA (Lanjutan)

TGR

Jenis Jamur (A)	Konsentrasi CuSO4 (B)	Lama Waktu (C)	Ulangan			Total Perlakuan
			1	2	3	
S. commune	0	0	43,225	110,361	110,361	263,947
		1	98,227	67,977	87,656	253,86
		2	141,000	110,361	175,250	426,611
		3	151,250	121,625	176,375	449,25
		4	125,400	128,356	125,606	379,362
		5	92,881	70,263	127,463	290,607
	Total A1B1K		**651,983**	**608,943**	**802,711**	**2063,637**
	0,5	0	106,901	68,944	67,472	243,317
		1	77,344	119,453	94,016	290,813
		2	150,500	136,875	127,375	414,75
		3	136,250	98,125	163,750	398,125
		4	116,463	118,594	117,013	352,07
		5	95,219	102,506	111,994	309,719
	Total A1B1K		**682,677**	**644,497**	**681,62**	**2008,794**
	1,5	0	63,754	110,361	45,317	219,432
		1	66,172	100,289	109,055	275,516
		2	124,250	132,000	157,125	413,375
		3	134,375	111,000	105,375	350,75
		4	115,775	113,781	116,394	345,95
		5	77,481	122,169	119,281	318,931
	Total A1B1K		**581,807**	**689,6**	**652,547**	**1923,954**
	2,5	0	73,359	71,965	110,361	255,685
		1	79,836	75,367	79,320	234,523
		2	137,750	156,500	157,125	451,375
		3	112,750	175,250	117,125	405,125
		4	108,763	108,006	108,213	324,982
		5	92,744	92,469	104,706	289,919
	Total A1B1K		**605,202**	**679,557**	**676,85**	**1961,609**
Total A1K			2521,669	2622,597	2813,728	7957,994
S. lacrymans	0	0	38,824	32,029	32,434	103,287
		1	55,992	43,639	90,975	190,606
		2	87,627	94,712	99,093	281,432
		3	265,398	268,008	267,356	800,762
		4	86,000	228,071	120,857	434,928
		5	79,357	195,571	82,000	356,928
	Total A1B1K		**613,198**	**862,03**	**692,715**	**2167,943**
	0,5	0	64,301	80,074	133,941	278,316
		1	61,131	190,246	161,033	412,41
		2	150,458	116,339	160,246	427,043
		3	236,966	225,966	232,305	695,237
		4	232,786	192,214	124,071	549,071
		5	85,500	119,500	163,643	368,643
	Total A1B1K		**831,142**	**924,339**	**975,239**	**2730,72**
	1,5	0	35,831	45,294	78,699	159,824
		1	85,746	153,549	125,869	365,164
		2	184,669	174,322	202,568	561,559
		3	243,771	242,000	242,373	728,144
		4	169,643	199,071	249,929	618,643
		5	163,643	131,857	94,214	389,714
	Total A1B1K		**883,303**	**946,093**	**993,652**	**2823,048**
	2,5	0	33,324	28,471	26,125	87,92
		1	51,574	106,123	129,656	287,353
		2	56,771	162,763	117,364	336,898
		3	248,898	247,127	248,246	744,271
		4	177,571	117,071	172,357	466,999
		5	62,857	84,500	71,214	218,571
	Total A1B1K		**630,995**	**746,055**	**764,962**	**2142,012**
Total A1K			2958,638	3478,517	3426,568	**9863,723**
TOTAL KELOMPOK			5480,307	6101,114	6240,296	17821,717

Source	DF	JK	KT	F-hit		F 0,05
Petak Utama (PU)						
Kelompok	2	0,028				
Jenis Jamur (A)	1	0,002	0,002	0,126	tn	18,510
Galat (a)	2	0,035	0,018			
Anak Petak						
Konsentrasi CuSO4 (b)	3	0,032	0,011	0,179	tn	3,410
Jenis Jamur * Konsentrasi CuSO4 (AxB)	3	0,009	0,003	0,050	tn	3,410
Galat (b)	12	0,703	0,059			
Anak-anak petak						
Lama Waktu (c)	5	0,460	0,092	35,725	**	**2,330**
Jenis Jamur *Lama Waktu (AxC)	5	0,151	0,030	11,748	**	2,330
Konsentrasi CuSO4 * Lama Waktu (BxC)	15	0,135	0,009	3,500	**	1,790
Jenis Jamur*Konsentrasi CuSO4*Lama Waktu (AxBxC)	15	0,170	0,011	4,403	**	1,790
Galat (c)	80	0,206	0,003			
Total	**143**	**1,903**				

Tabel t	Signifikasi		Sd	LSD
	0,05	0,01		0,05
Galat (a)	4,303	9,925	0,022048	0,094872
Galat (b)	2,086	2,845	0,057049	0,119005
Galat (c)	1,993	2,646	0,014649	0,029195

Lampiran 3. ANOVA (Lanjutan)

Susut Berat Bahan

Jenis Jamur (A)	Konsentrasi CuSO4 (B)	Lama Waktu (C)	Ulangan			Total Perlakuan
			1	2	3	
S. commune	0	0	0,000	0,000	0,000	0
		1	0,062	0,013	0,061	0,136
		2	0,062	0,051	0,098	0,211
		3	0,062	0,076	0,110	0,248
		4	0,111	0,089	0,134	0,334
		5	0,111	0,089	0,122	0,322
	Total A1B1K		**0,408**	**0,318**	**0,525**	**1,251**
	0,5	0	0,000	0,000	0,000	0
		1	0,025	0,060	0,061	0,146
		2	0,049	0,084	0,073	0,206
		3	0,074	0,096	0,085	0,255
		4	0,099	0,061	0,061	0,221
		5	0,086	0,096	0,110	0,292
	Total A1B1K		**0,333**	**0,397**	**0,39**	**1,12**
	1,5	0	0,000	0,000	0,000	0
		1	0,038	0,049	0,013	0,1
		2	0,050	0,061	0,036	0,147
		3	0,063	0,073	0,050	0,186
		4	0,100	0,122	0,125	0,347
		5	0,100	0,098	0,088	0,286
	Total A1B1K		**0,351**	**0,403**	**0,312**	**1,066**
	2,5	0	0,000	0,000	0,000	0
		1	0,036	0,038	0,013	0,087
		2	0,048	0,048	0,036	0,132
		3	0,060	0,063	0,063	0,186
		4	0,120	0,076	0,125	0,321
		5	0,084	0,063	0,075	0,222
	Total A1B1K		**0,348**	**0,288**	**0,312**	**0,948**
Total A1K			1,44	1,406	1,539	4,385
S. lacrymans	0	0	0,000	0,000	0,000	0
		1	0,053	0,011	0,086	0,15
		2	0,085	0,100	0,086	0,271
		3	0,037	0,108	0,170	0,315
		4	0,160	0,111	0,140	0,411
		5	0,096	0,301	0,049	0,446
	Total A1B1K		**0,431**	**0,631**	**0,531**	**1,593**
	0,5	0	0,000	0,000	0,000	0
		1	0,012	0,048	0,072	0,132
		2	0,037	0,071	0,072	0,18
		3	0,082	0,106	0,134	0,322
		4	0,085	0,119	0,133	0,337
		5	0,111	0,146	0,143	0,4
	Total A1B1K		**0,327**	**0,49**	**0,554**	**1,371**
	1,5	0	0,000	0,000	0,000	0
		1	0,024	0,012	0,048	0,084
		2	0,049	0,085	0,131	0,265
		3	0,095	0,099	0,133	0,327
		4	0,122	0,098	0,131	0,351
		5	0,134	0,110	0,143	0,387
	Total A1B1K		**0,424**	**0,404**	**0,586**	**1,414**
	2,5	0	0,000	0,000	0,000	0
		1	0,062	0,047	0,025	0,134
		2	0,086	0,118	0,074	0,278
		3	0,111	0,172	0,085	0,368
		4	0,170	0,176	0,111	0,457
		5	0,169	0,094	0,148	0,411
	Total A1B1K		**0,598**	**0,607**	**0,443**	**1,648**
Total A1K			1,78	2,132	2,114	**6,026**
TOTAL KELOMPOK			3,22	3,538	3,653	10,411

Source	DF	JK	KT	F-hit		F 0,05
Petak Utama (PU)						
Kelompok	2	0,0021				
Jenis Jamur (A)	1	0,019	0,019	2,432	tn	18,510
Galat (a)	2	0,015	0,008			
Anak Petak						
Konsentrasi CuSO4 (b)	3	0,002	0,001	0,620	tn	3,410
Jenis Jamur * Konsentrasi CuSO4 (AxB)	3	0,003	0,001	0,851	tn	3,410
Galat (b)	12	0,015	0,001			
Anak-anak petak						
Lama Waktu (c)	5	0,249	0,050	60,673	******	**2,330**
Jenis Jamur *Lama Waktu (AxC)	5	0,010	0,002	2,368	**	2,330
Konsentrasi CuSO4 * Lama Waktu (BxC)	15	0,006	0,000	0,514	tn	1,790
Jenis Jamur*Konsentrasi CuSO4*Lama Waktu (AxBxC)	15	0,004	0,000	0,340	tn	1,790
Galat (c)	80	0,066	0,001			
Total	**143**	**0,390**				

Tabel t	**Signifikasi**		**Sd**	**LSD**
	0,05	**0,01**		**0,05**
Galat (a)	4,303	9,925	0,014616	0,062893
Galat (b)	2,086	2,845	0,008439	0,017603
Galat (c)	1,993	2,646	0,008269	0,016481

Lampiran 3. ANOVA (Lanjutan)

pH

Jenis Jamur (A)	Konsentrasi CuSO4 (B)	Lama Waktu (C)	Ulangan			Total Perlakuan
			1	2	3	
S. commune	0	0	7,060	6,930	7,070	21,06
		1	6,840	6,900	6,900	20,64
		2	6,720	6,720	6,750	20,19
		3	6,690	6,700	6,710	20,1
		4	6,450	6,450	6,570	19,47
		5	6,620	6,700	6,590	19,91
	Total A1B1K		**40,38**	**40,4**	**40,59**	**121,37**
	0,5	0	7,040	6,950	6,960	20,95
		1	6,820	6,810	6,810	20,44
		2	6,810	6,770	6,780	20,36
		3	6,800	6,690	6,720	20,21
		4	6,520	6,510	6,520	19,55
		5	6,730	6,710	6,550	19,99
	Total A1B1K		**40,72**	**40,44**	**40,34**	**121,5**
	1,5	0	6,670	6,630	6,710	20,01
		1	6,520	6,550	6,710	19,78
		2	6,500	6,480	6,800	19,78
		3	6,480	6,350	6,580	19,41
		4	6,390	6,710	6,490	19,59
		5	6,680	6,610	6,810	20,1
	Total A1B1K		**39,24**	**39,33**	**40,1**	**118,67**
	2,5	0	7,060	6,930	6,910	20,9
		1	6,860	6,820	6,840	20,52
		2	6,830	6,730	6,800	20,36
		3	6,690	6,650	6,610	19,95
		4	6,770	6,470	6,530	19,77
		5	6,860	6,600	6,700	20,16
	Total A1B1K		**41,07**	**40,2**	**40,39**	**121,66**
Total A1K			161,41	160,37	161,42	483,2
S. lacrymans	0	0	7,820	7,870	7,870	23,56
		1	7,800	7,810	7,770	23,38
		2	7,800	7,530	7,740	23,07
		3	7,790	7,500	7,690	22,98
		4	7,750	7,500	7,490	22,74
		5	7,750	7,520	7,130	22,4
	Total A1B1K		**46,71**	**45,73**	**45,69**	**138,13**
	0,5	0	7,730	7,880	7,890	23,5
		1	7,700	7,730	7,780	23,21
		2	7,670	7,650	7,690	23,01
		3	7,630	7,880	7,590	23,1
		4	7,500	7,430	7,520	22,45
		5	7,210	7,380	7,230	21,82
	Total A1B1K		**45,44**	**45,95**	**45,7**	**137,09**
	1,5	0	7,770	7,900	7,860	23,53
		1	7,710	7,850	7,800	23,36
		2	7,620	7,850	7,760	23,23
		3	7,580	7,690	7,650	22,92
		4	7,580	7,630	7,430	22,64
		5	7,400	7,640	7,640	22,68
	Total A1B1K		**45,66**	**46,56**	**46,14**	**138,36**
	2,5	0	7,780	8,030	7,740	23,55
		1	7,650	7,950	7,640	23,24
		2	7,520	7,880	7,550	22,95
		3	7,400	7,370	7,450	22,22
		4	7,380	7,350	7,290	22,02
		5	7,640	7,190	7,640	22,47
	Total A1B1K		**45,37**	**45,77**	**45,31**	**136,45**
Total A1K			183,18	184,01	182,84	**550,03**
TOTAL KELOMPOK			344,59	344,38	344,26	1033,23

Source	DF	JK	KT	F-hit		F 0,05
Petak Utama (PU)						
Kelompok	2	0,028				
Jenis Jamur (A)	1	0,002	0,002	0,126	tn	18,510
Galat (a)	2	0,035	0,018			
Anak Petak						
Konsentrasi CuSO4 (b)	3	0,032	0,011	0,179	tn	3,410
Jenis Jamur * Konsentrasi CuSO4 (AxB)	3	0,009	0,003	0,050	tn	3,410
Galat (b)	12	0,703	0,059			
Anak-anak petak						
Lama Waktu (c)	5	0,460	0,092	35,725	**	**2,330**
Jenis Jamur *Lama Waktu (AxC)	5	0,151	0,030	11,748	**	2,330
Konsentrasi CuSO4 * Lama Waktu (BxC)	15	0,135	0,009	3,500	**	1,790
Jenis Jamur*Konsentrasi CuSO4*Lama Waktu (AxBxC)	15	0,170	0,011	4,403	**	1,790
Galat (c)	80	0,206	0,003			
Total	**143**	**1,903**				

Tabel t	Signifikasi		Sd	LSD
	0,05	0,01		0,05
Galat (a)	4,303	9,925	0,022048	0,094872
Galat (b)	2,086	2,845	0,057049	0,119005
Galat (c)	1,993	2,646	0,014649	0,029195

Lampiran 3. ANOVA (Lanjutan)

Aktivitas Enzim MnP

Lama waktu (minggu) (A)	Konsentrasi CuSO4 (mM) (B)	Kelompok (K)			Total Perlakuan
		1	2	3	
0	0	0	0	0	0
	0,5	0	0	0	0
	1,5	0	0	0	0
	2,5	0	0	0	0
1	0	0,103	0,103	0,103	0,309
	0,5	0,103	0,103	0,103	0,309
	1,5	0,103	0,205	0,103	0,411
	2,5	0,18	0,21	0,2	0,59
2	0	0,103	0,103	0,205	0,411
	0,5	0,103	0,103	0,103	0,309
	1,5	0,103	0,205	0,103	0,411
	2,5	0,103	0,205	0,103	0,411
3	0	0,205	0,308	0,205	0,718
	0,5	0,103	0,205	0,205	0,513
	1,5	0,205	0,103	0,205	0,513
	2,5	0,205	0,205	0,103	0,513
4	0	0,308	0,205	0,103	0,616
	0,5	0,205	0,308	0,308	0,821
	1,5	0,513	0,41	0,513	1,436
	2,5	0,103	0,205	0,41	0,718
5	0	0,103	0,103	0,205	0,411
	0,5	0,308	0,205	0,103	0,616
	1,5	0,205	0,308	0,205	0,718
	2,5	0,205	0,103	0,308	0,616
Total a1k		**3,569**	**3,905**	**3,896**	**11,37**

Sumber ragam	**DB**	**JK**	**KT**	**F-hit**		**F 0,05**
Ulangan	2	0,159	0,079	10,844	**	3,200
Perlakuan	23	2,876	0,125	17,061	**	1,750
Lama Waktu (A)	5	2,745	0,549	74,911	**	2,420
Inducer (B)	3	0,077	0,026	3,509	**	2,810
AB	15	0,054	0,004	0,488	tb	1,890
Galat (b)	46	0,337	0,007			
Total		**6,249**				

Lampiran 3. ANOVA (Lanjutan)

Aktivitas Lakase

Lama waktu (minggu) (A)	Konsentrasi CuSO4 (mM) (B)	Kelompok (K)			Total Perlakuan
		1	2	3	
0	0	0	0	0	0
	0,5	0	0	0	0
	1,5	0	0	0	0
	2,5	0	0	0	0
1	0	0,083	0,083	0,11	0,276
	0,5	0,083	0,083	0,11	0,276
	1,5	0,11	0,11	0,11	0,33
	2,5	0,083	0,083	0,11	0,276
2	0	0,11	0,11	0,083	0,303
	0,5	0,138	0,11	0,083	0,331
	1,5	0,138	0,11	0,11	0,358
	2,5	0,11	0,138	0,11	0,358
3	0	0,193	0,083	0,165	0,441
	0,5	0,22	0,193	0,138	0,551
	1,5	0,165	0,193	0,193	0,551
	2,5	0,11	0,165	0,138	0,413
4	0	0,11	0,083	0,11	0,303
	0,5	0,11	0,11	0,055	0,275
	1,5	0,083	0,055	0,083	0,221
	2,5	0,028	0,055	0	0,083
5	0	0,055	0,028	0,055	0,138
	0,5	0,055	0,055	0,055	0,165
	1,5	0,055	0,028	0,028	0,111
	2,5	0,028	0,028	0,028	0,084
Total a1k		**2,067**	**1,903**	**1,874**	**5,844**

Sumber ragam	**DB**	**JK**	**KT**	**F-hit**		**F 0,05**
Ulangan	2	0,001	0,000	0,980	tb	3,200
Perlakuan	23	0,211	0,009	19,936	**	1,750
Lama Waktu (A)	5	0,194	0,039	84,123	**	2,420
Inducer (B)	3	0,005	0,002	3,696	**	2,810
AB	15	0,012	0,001	1,788	tb	1,890
Galat (b)	46	0,021	0,000			
Total		**0,444**				

Lampiran 3. ANOVA (Lampiran)

Aktivitas H_2O_2

Lama waktu (minggu) (A)	Konsentrasi CuSO4 (mM) (B)	Kelompok (K)			Total Perlakuan
		1	2	3	
0	0	0	0	0	0
	0,5	0	0	0	0
	1,5	0	0	0	0
	2,5	0	0	0	0
1	0	0,236	0,109	0,091	0,436
	0,5	0,122	0,096	0,133	0,351
	1,5	0,413	0,136	0,057	0,606
	2,5	0,287	0,182	0,201	0,67
2	0	0,375	0,157	0,242	0,774
	0,5	0,15	0,292	0,242	0,684
	1,5	0,513	0,182	0,179	0,874
	2,5	0,393	0,395	0,221	1,009
3	0	0,408	0,214	0,272	0,894
	0,5	0,238	0,373	0,356	0,967
	1,5	0,534	0,272	0,2	1,006
	2,5	0,51	0,407	0,236	1,153
4	0	0,611	0,3	0,433	1,344
	0,5	0,433	0,446	0,378	1,257
	1,5	0,47	0,357	0,3	1,127
	2,5	0,559	0,581	0,406	1,546
5	0	0,726	0,565	0,652	1,943
	0,5	0,631	0,585	0,418	1,634
	1,5	0,532	0,618	0,581	1,731
	2,5	0,748	0,781	0,587	2,116
Total a1k		**8,889**	**7,048**	**6,185**	**22,122**

Sumber ragam	**DB**	**JK**	**KT**	**F-hit**		**F 0,05**
Ulangan	2	0,159	0,079	10,844	**	3,200
Perlakuan	23	2,876	0,125	17,061	**	1,750
Lama Waktu (A)	5	2,745	0,549	74,911	**	2,420
Inducer (B)	3	0,077	0,026	3,509	**	2,810
AB	15	0,054	0,004	0,488	tb	1,890
Galat (b)	46	0,337	0,007			
Total		**6,249**				

Lampiran 4. Glosarium

$CuSO_4$: Tembaga Sulphat

$MnSO_4$: Mangan Sulphat

ROS : *Reactive oxygen Species*

H_2O_2 : Hydrogen peroxide

OH* : Hydroxyl radical

O^{2-} : Superoxide radicals

pH : Power of hydrogen

LiP : Lignin Peroksidase

MnP : Mangan Peroksidase

m/z : Massa per muatan

Fe^{2+} : Ferro

Fe^{3+} : Ferri

O_2 : Oksigen

H_2O : Air

SL : *Serpula lacrymans*

SC : *Schyzophyllum commune*